

WHAT IS CLAIMED IS:

1. An apparatus comprising a receiving unit which includes:

a connector;

a locking part supported for movement between locking and unlocking positions;

a cartridge receiving portion into which a cartridge can be removably inserted to an inserted position, wherein when a cartridge is in said cartridge receiving portion, said locking part engages the cartridge in said locking position thereof to resist cartridge removal, and a connector of the cartridge is releasably coupled to said connector of said receiving unit in order to electrically couple said receiving unit to an information storage section of the cartridge;

a retaining portion which resists movement of said locking part away from said locking position when a cartridge is inserted in the cartridge receiving portion and engaged with said locking part;

an eject member supported for movement between a retracted position and an eject position, wherein as said eject member moves from said retracted position to said eject position said eject member engages and moves said locking member away from said locking position toward said unlocking position, and wherein when a cartridge is in said cartridge receiving portion as said eject member moves from said retracted position to said eject position, said eject member engages and moves the cartridge away from the insertion position in a manner effecting disengagement of said connector of said receiving unit from a connector of the cartridge; and

a drive portion responsive to the occurrence of a predetermined condition for effecting movement of said eject member from said retracted position to said eject position.

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2. An apparatus according to Claim 1,

wherein said retaining portion yieldably urges said locking part toward said locking position thereof;

10 wherein said locking part has on a side thereof facing away from said unlocking position a recess, a first cam surface that extends away from said recess on one side thereof, and a second cam surface, wherein a locking portion of a cartridge being inserted into said cartridge receiving portion slides along said first cam  
15 surface while moving said locking part away from said locking position to facilitate engagement of the locking portion with said recess in the inserted position of the cartridge; and

20 wherein said eject member has a cam follower portion which slidably engages said second cam surface as said eject member moves from said retracted position to said eject position in order to effect movement of said locking part away from said locking position against the urging of said retaining portion.

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3. An apparatus according to Claim 2,

wherein said receiving unit includes a further locking part supported for movement between locking and retracted positions;

wherein said connector of said receiving unit is disposed between said locking parts;

wherein movement of each said locking part toward said locking position thereof is movement away from the other of said locking parts;

wherein said retaining portion yieldably urges said  
further locking part toward said locking position  
thereof;

wherein said further locking part has on a side thereof facing generally away from said unlocking position thereof a further recess, a third cam surface that extends away from said further recess on one side thereof, and a fourth cam surface, wherein a further locking portion of a cartridge being inserted into said cartridge receiving portion slides along said third cam surface while moving said further locking part away from said locking position thereof to facilitate engagement of the further locking portion with said further recess in the inserted position of the cartridge; and

wherein said eject member has a further cam follower portion which slidably engages said fourth cam surface as said eject member moves from said retracted position to said eject position in order to effect movement of said further locking part away from said locking position thereof against the urging of said retaining portion.

4. An apparatus according to Claim 3,  
wherein said eject member has a central opening  
therethrough;

5 wherein said cam follower portions of said eject  
member are provided adjacent opposite sides of said  
central opening;

10 wherein said connector of said receiving unit is  
disposed within said central opening during at least a  
portion of the path of travel of said eject member  
between said retracted and eject positions; and

wherein said locking parts each extend through said  
central opening on opposite sides of said connector of  
said receiving unit.

15 5. An apparatus according to Claim 3, including a  
cartridge which has a connector and which has locking  
recesses that are disposed on opposite sides of said  
connector and that each have a respective said locking  
portion therein, said cartridge being removably inserted  
20 in said cartridge receiving portion so that said  
connector of said cartridge is releasably engaged with  
said connector of said receiving unit, and so that each  
said locking part is engaged with said locking portion  
within a respective said locking recess.

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6. An apparatus according to Claim 2,  
wherein said second cam surface extends away from  
said recess on a side thereof opposite from said first  
cam surface;

5 wherein said cam follower portion of said eject  
member engages said recess in said eject position of said  
eject member to resist movement of said eject member away  
from said eject position so that said eject member  
maintains said locking part in a position which  
10 facilitates engagement of said locking part with a  
cartridge when a cartridge is subsequently inserted into  
said cartridge receiving portion; and

15 wherein at least one of said recess and said second  
cam surface is shaped to facilitate sliding movement of  
said cam follower portion out of said recess and onto  
said second cam surface in response to exertion of an  
insertion force onto said eject member by a cartridge  
being inserted into said cartridge receiving portion.

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7. An apparatus according to Claim 6,  
wherein said receiving unit includes a further  
locking part supported for movement between locking and  
retracted positions;

5 wherein said connector of said receiving unit is  
disposed between said locking parts;

wherein movement of each said locking part toward  
said locking position thereof is movement generally away  
from the other of said locking parts;

10 wherein said retaining portion yieldably urges said  
further locking part toward said locking position  
thereof;

wherein said further locking part has on a side  
thereof facing away from said unlocking position thereof  
15 a further recess, a third cam surface that extends away  
from said further recess on one side thereof, and a  
fourth cam surface, wherein a further locking portion of  
a cartridge being inserted into said cartridge receiving  
portion slides along said third cam surface while moving  
20 said further locking part away from said locking position  
thereof to facilitate engagement of the further locking  
portion with said further recess in the inserted position  
of the cartridge;

wherein said eject member has a further cam follower  
25 portion which slidably engages said fourth cam surface as  
said eject member moves from said retracted position to  
said eject position in order to effect movement of said  
further locking part away from said locking position  
thereof against the urging of said retaining portion;

30 wherein said fourth cam surface extends away from  
said further recess on a side thereof opposite from said  
third cam surface;

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9. An apparatus according to Claim 6, wherein said locking part has a stop surface on a side of said second cam surface remote from said recess, said stop surface engaging said eject member in said retracted position to prevent movement of said eject member past said retracted position.

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10. An apparatus according to Claim 9,  
wherein said receiving unit includes a further  
locking part supported for movement between locking and  
retracted positions;

5 wherein said connector of said receiving unit is  
disposed between said locking parts;

wherein movement of each said locking part toward  
said locking position thereof is movement generally away  
from the other of said locking parts;

10 wherein said retaining portion yieldably urges said  
further locking part toward said locking position  
thereof;

wherein said further locking part has on a side  
thereof facing away from said unlocking position thereof  
15 a further recess, a third cam surface that extends away  
from said further recess on one side thereof, and a  
fourth cam surface, wherein a further locking portion of  
a cartridge being inserted into said cartridge receiving  
portion slides along said third cam surface while moving  
20 said further locking part away from said locking position  
thereof to facilitate engagement of the further locking  
portion with said further recess in the inserted position  
of the cartridge;

wherein said eject member has a further cam follower  
25 portion which slidably engages said fourth cam surface as  
said eject member moves from said retracted position to  
said eject position in order to effect movement of said  
further locking part away from said locking position  
thereof against the urging of said retaining portion;

30 wherein said fourth cam surface extends away from  
said further recess on a side thereof opposite from said  
third cam surface;

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5 wherein said further cam follower portion of said eject member engages said further recess in said eject position of said eject member to resist movement of said eject member away from said eject position so that said eject member maintains said further locking part in a position which facilitates engagement of said further locking part with a cartridge when a cartridge is subsequently inserted into said cartridge receiving portion;

10 wherein at least one of said further recess and said fourth cam surface is shaped to facilitate sliding movement of said further cam follower portion out of said further recess and onto said fourth cam surface in response to exertion of an insertion force onto said  
15 eject member by a cartridge being inserted into said cartridge receiving portion; and

20 wherein said further locking member has a further stop surface on a side of said fourth cam surface remote from said further recess, said further stop surface engaging said eject member in said retracted position to prevent movement of said eject member past said retracted position.

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11. An apparatus according to Claim 10,  
wherein said eject member has a central opening  
therethrough;

5 wherein said cam follower portions of said eject  
member are provided adjacent opposite sides of said  
central opening;

10 wherein said connector of said receiving unit is  
disposed within said central opening during at least a  
portion of the path of travel of said eject member  
between said retracted and eject positions; and

wherein said locking parts each extend through said  
central opening on opposite sides of said connector of  
said receiving unit.

15 12. An apparatus according to Claim 11, wherein  
said movement of each said locking part is pivotal  
movement about a respective pivot axis spaced radially  
from said recess and said cam surfaces thereon.

20 13. An apparatus according to Claim 12, wherein  
said retaining portion includes a spring element which is  
supported on said receiving unit and which has opposite  
ends that each engage a respective one of said locking  
parts and yieldably urge movement of said locking parts  
25 toward said locking positions thereof.

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14. An apparatus according to Claim 1,  
wherein said eject member has a surface portion  
thereon which faces away from a direction in which said  
eject member moves toward said eject position; and

5 wherein said drive portion includes a rotatable  
member having an actuating portion thereon which is  
engageable with said surface portion on said eject member  
in a manner so that said eject member is moved from said  
retracted position to said eject position by said  
10 actuating portion in response to rotation of said  
rotatable member by said drive portion.

15 15. An apparatus according to Claim 14, wherein  
said actuating portion of said rotatable member moves out  
of engagement with said surface portion of said eject  
member in response to further rotation of said rotatable  
member after said eject member has reached said eject  
position, said eject member being movable from said eject  
position to said retracted position free of engagement  
20 between said surface portion thereon and said actuating  
portion of said rotatable member.

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16. An apparatus according to Claim 15,  
wherein said rotatable member is normally stationary  
in a predetermined initial angular position;

5 wherein said drive portion is responsive to said  
predetermined condition for effecting rotation of said  
rotatable member; and

10 wherein said drive portion includes a switch which  
is actuated by said actuating portion after said  
actuating portion has moved out of engagement with said  
surface portion of said eject member, said drive portion  
being responsive to actuation of said switch for stopping  
said rotation of said rotatable member.

17. An apparatus according to Claim 15,  
15 wherein said rotatable member is normally stationary  
in a predetermined initial angular position; and

20 wherein said drive portion is responsive to said  
predetermined condition for effecting a single 360°  
rotation of said rotatable member which begins and ends  
with said rotatable member in said initial angular  
position.

18. An apparatus according to Claim 17,  
25 wherein said rotatable member has gear teeth  
thereon;

wherein said actuating portion is a pin on said  
actuating member which is positioned eccentrically to an  
axis of rotation thereof; and

30 wherein said drive portion includes a motor having a  
rotatable shaft, and a gear train which drivingly couples  
said shaft of said motor to said gear teeth of said  
rotatable member.

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19. An apparatus according to Claim 1,  
wherein said drive portion includes a motor having a  
rotatable shaft; and

5 wherein all operational movement of said shaft  
involves rotation of said shaft in a single rotational  
direction.

10 20. An apparatus according to Claim 1, wherein said  
locking part is configured so that said locking part will  
be urged toward said locking position thereof when said  
eject member is in said retracted position and a force is  
exerted on said locking member by a cartridge engaged  
therewith in a direction corresponding to cartridge  
withdrawal.

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21. An apparatus according to Claim 20,  
including a further locking part supported for  
movement between locking and unlocking positions;

5 wherein when a cartridge is removably inserted into  
said cartridge receiving portion to an inserted position  
said further locking part is engageable therewith when  
said further locking part is in said locking position  
thereof, said retaining portion resisting movement of  
10 said further locking part away from said locking position  
thereof when said locking part is releasably engaged with  
a cartridge;

wherein said eject member engages and moves said  
further locking part away from said locking position  
thereof toward said unlocking position thereof during  
15 movement of said eject member from said retracted  
position to said eject position; and

wherein said further locking part is configured so  
that said further locking part will be urged toward said  
locking position thereof if said eject member is in said  
20 retracted position and if a force is exerted on said  
further locking member by a cartridge engaged therewith  
in a direction corresponding to cartridge withdrawal.

22. An apparatus according to Claim 21, wherein  
25 said movement of each of said locking parts is pivotal  
movement about a respective pivot axis.

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23. A method of operating an apparatus which includes a receiving unit having a connector and having a cartridge receiving portion into which a cartridge can be removably inserted to an inserted position, comprising  
5 the steps of:

supporting a locking part for movement between locking and unlocking positions;

causing the locking part, when a cartridge is disposed in said cartridge receiving portion, to engage the cartridge in said locking position thereof to resist  
10 cartridge removal from a position in which a connector of the cartridge is engaged with said connector of said receiving unit to electrically couple said receiving unit to an information storage section of the cartridge;

resisting movement of said locking part away from said locking position with a retaining portion when a cartridge is disposed in the cartridge receiving portion and engaged with said locking part;

supporting an eject member for movement between a retracted position and an eject position;

causing said eject member to move said locking member away from said locking position toward said unlocking position during movement of said eject member from said retracted position to said eject position;

causing said eject member, when a cartridge is disposed in said cartridge receiving portion, to engage and move the cartridge away from its insertion position as said eject member moves from said retracted position to said eject position, in a manner effecting  
25 disengagement of said connector of said receiving unit from a connector of the cartridge; and  
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responding to the occurrence of a predetermined event by causing a drive portion to effect movement of said eject member from said retracted position to said eject position.

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24. A method according to Claim 23,

wherein said step of resisting movement with said retaining portion includes the step of yieldably urging said locking part toward said locking position thereof; and

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including the steps of:

configuring said locking part to have, on a side thereof facing away from said unlocking position, a recess, a first cam surface that extends away from said recess on one side thereof, and a second cam surface;

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causing a locking portion of a cartridge being inserted into said cartridge receiving portion to slide along said first cam surface while moving said locking part away from said locking position to facilitate engagement of the locking portion with said recess in the inserted position of the cartridge; and

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causing a cam follower portion on said eject member to slidably engage said second cam surface as said eject member moves from said retracted position to said eject position in order to effect movement of said locking part away from said locking position against the urging of said retaining portion.

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25. A method according to Claim 24, including the steps of:

configuring said locking part so that said second cam surface extends away from said recess on a side thereof opposite from said first cam surface;

causing said cam follower portion of said eject member to engage said recess in said eject position of said eject member to resist movement of said eject member away from said eject position so that said eject member maintains said locking part in a position which facilitates engagement of said locking part with a cartridge as a cartridge is subsequently being inserted into said cartridge receiving portion; and

configuring said locking part so that at least one of said recess and said second cam surface is shaped to facilitate sliding movement of said cam follower portion out of said recess and onto said second cam surface in response to exertion of an insertion force onto said eject member by a cartridge being inserted into said cartridge receiving portion.

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26. A method according to Claim 25, including the steps of:

supporting a further locking part for movement between locking and retracted positions so that said connector of said receiving unit is disposed between said locking parts, and so that movement of each said locking part toward said locking position thereof is movement generally away from the other of said locking parts;

causing said retaining portion to yieldably urge said further locking part toward said locking position thereof;

configuring said further locking part to have on a side thereof facing away from said unlocking position thereof a further recess, a third cam surface that extends away from said further recess on one side thereof, and a fourth cam surface;

causing a further locking portion of a cartridge being inserted into said cartridge receiving portion to slide along said third cam surface while moving said further locking part away from said locking position thereof to facilitate engagement of the further locking portion with said further recess in the inserted position of the cartridge;

causing a further cam follower portion of said eject member to slidably engage said fourth cam surface as said eject member moves from said retracted position to said eject position in order to effect movement of said further locking part away from said locking position thereof against the urging of said retaining portion;

configuring said fourth cam surface to extend away from said further recess on a side thereof opposite from said third cam surface;

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causing said further cam follower portion of said eject member to engage said further recess in said eject position of said eject member to resist movement of said eject member away from said eject position so that said eject member maintains said further locking part in a position which facilitates engagement of said further locking part with a cartridge when a cartridge is subsequently inserted into said cartridge receiving portion; and

configuring said further locking member so that at least one of said further recess and said fourth cam surface is shaped to facilitate sliding movement of said further cam follower portion out of said further recess and onto said fourth cam surface in response to exertion of an insertion force onto said eject member by a cartridge being inserted into said cartridge receiving portion.

27. A method according to Claim 26, including the step of providing a central opening through said eject member with said cam follower portions of said eject member adjacent opposite sides of said central opening, said connector of said receiving unit being disposed within said central opening during at least a portion of the path of travel of said eject member between said retracted and eject positions, and said locking parts each extending through said central opening on opposite sides of said connector of said receiving unit.

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28. A method according to Claim 23, including the steps of:

providing on said eject member a surface portion which faces away from a direction in which said eject member moves toward said eject position; and

supporting a rotatable member of said drive portion for rotation and providing thereon an actuating portion which is engageable with said surface portion on said eject member in a manner so that said eject member is moved from said retracted position to said eject position by said actuating portion in response to rotation of said rotatable member by said drive portion.

29. A method according to Claim 28, including the step of causing said actuating portion of said rotatable member to move out of engagement with said surface portion of said eject member in response to further rotation of said rotatable member after said eject member has reached said eject position, said eject member being movable from said eject position to said retracted position free of engagement between said surface portion thereon and said actuating portion of said rotatable member.

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30. A method according to Claim 29, including the steps of:

normally maintaining said rotatable member stationary in a predetermined initial angular position;

5        responding to said predetermined condition by effecting rotation of said rotatable member;

causing said actuating portion to actuate a switch after said actuating portion has moved out of engagement with said surface portion of said eject member; and

10        responding to actuation of said switch by stopping said rotation of said rotatable member.

31. A method according to Claim 29,

15        wherein said rotatable member is normally stationary in a predetermined initial angular position; and

including the step of responding to said predetermined condition by effecting a single 360° rotation of said rotatable member which begins and ends with said rotatable member in said initial angular position.

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32. A method according to Claim 23, including the step of configuring said locking part so that said locking part will be urged toward said locking position thereof when said eject member is in said retracted position and a force is exerted on said locking part by a cartridge engaged therewith in a direction corresponding to cartridge withdrawal.

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